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OFFSHORE FISHES OF THE ARAFURA SEA

BARRY C. RUSSELL AND WAYNE HOUSTON
Northern Territory Museum of Arts and Sciences,
G.P.O. Box 4646, Darwin, NT 0801, Australia.

ABSTRACT

The species composition, zoogeographic affinities and importance to fisheries of the offshore fish fauna of the Arafura Sea is examined. A total of 527 species from 141 families are recorded. Most of the fishes are shallow-water, benthic species belonging to widespread Indo-Pacific families. Remaining fishes are deeper water or epipelagic forms with Indo-Pacific or Cosmopolitan distributions. The 10 most speciose families (Carangidae, Lutjanidae, Carcharhinidae, Leiognathidae, Nemipteridae, Platycephalidae, Serranidae, Scorpaenidae, Mullidae, Bothidae) contain about 34% of the total number of species. Greatest faunal affinity is seen with the fish fauna of the North-west Shelf of Western Australia. Fishing methods in the Arafura Sea include bottom trawl, gillnet, longline, and handline. Of the total species recorded, 491 (93.2%) were taken by bottom trawl; 108 species (20.5%) are retained as catch; and 163 by-catch species (30.9%), presently discarded, are potentially useful for food, bait, or processing as fish meal and petfood. Some 23 species (4.4%) are dominant in bottom trawls and comprise about 70% of the total catch biomass.

KEYWORDS: Offshore fish fauna, Arafura Sea, taxonomic composition, zoogeography, fisheries importance.

INTRODUCTION

The fishes of the Arafura Sea are probably the least well known of any Australian region. Much of our present knowledge of the fish fauna of northern Australia is based on scattered records and collections of fishes mainly from shallow water and inshore reef areas (e.g. Paradice and Whitley 1927; Taylor 1964). Despite the fact that since 1971 the Arafura Sea has supported an important foreign trawl and gillnet fishery, there have been few collections from offshore fishing vessels until comparatively recently.

In this paper we examine the species composition and zoogeographic affinities of the offshore fish fauna of the Arafura Sea. Our work is based mainly on trawl and other offshore collections made over the last 10 years, but also includes earlier records. It is to be hoped that this paper will provide a taxonomically up-to-date and useful reference to the commercially important and common fishes taken in demersal trawls or gillnets, as well as the lesser known species which form much of the by-catch of these fisheries.

STUDY AREA

The present work deals with fishes collected from offshore localities of the Arafura Sea, generally from that part of the shelf beyond 12 nautical miles (22 km) from the coast, outside of the restricted area of the Australian Fishing Zone. These offshore waters of the Arafura Sea are fished mainly by foreign vessels operating under bilateral or joint-venture arrangements (Branford 1984).

The Arafura Sea (Fig. 1) covers an area of about 650,000 km^2. This area, which includes the Aru Islands and deep Aru Trough, is bordered on the north by the Outer Banda Arc and coast of Irian Jaya; on the east by Torres Strait (141°E); on the south by the Gulf of Carpentaria (here defined as extending southwards of a line from Cape Arnhem to Crab I.,

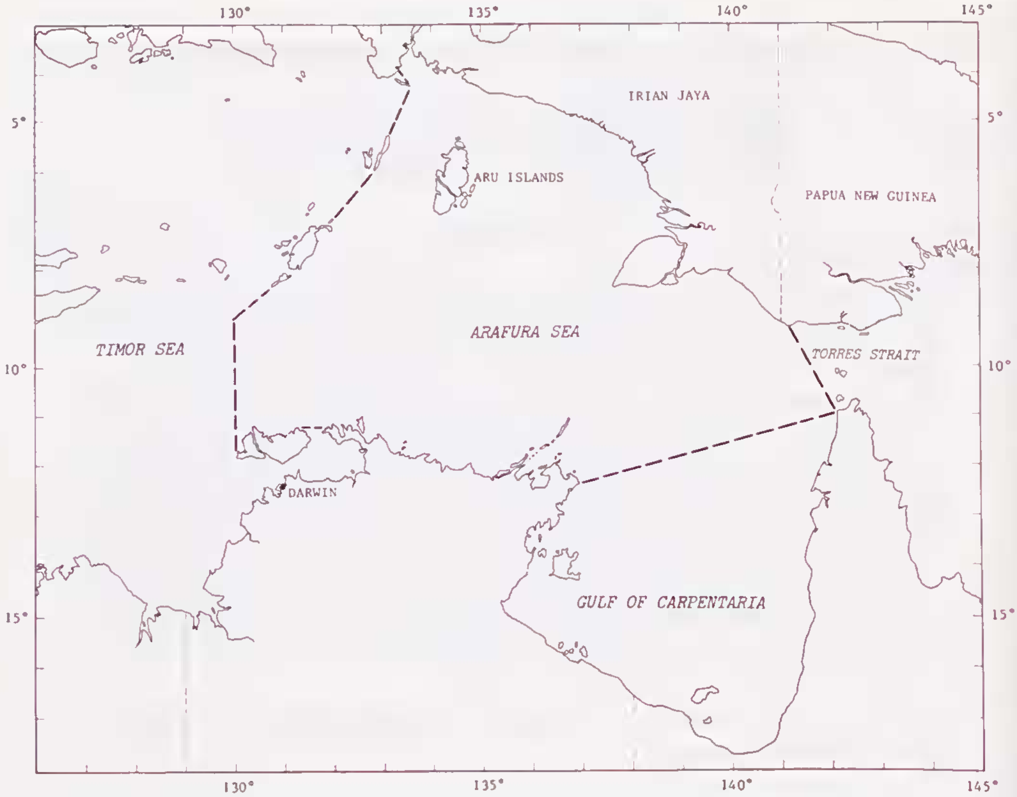

Fig. 1. Location map of the Arafura Sea and its boundaries (dashed lines) as defined in the text.

off Cape York Peninsula) and the northern Australia coast; and on the west by the 130°E meridian (Tjia 1966).

The Arafura Sea largely covers a vast, shallow bank (the Arafura Shelf) that is composed mainly of glauconitic sand and calcareous mud (Tjia 1966; Jongsma 1974). Depths over most of the Arafura Shelf generally range between 50-80 m. Deeper parts are located beyond the edge of the continental shelf to the north-west. Here the Arafura Shelf is separated from the outer Banda Arc by the deep Aru Trough (3650 m) which has an area of 1,000 km² below the 3,000 m isobath (Tjia 1966).

Tjia (1966) summarised hydrographic conditions in the Arafura Sea. Surface salinities range from 33.6‰ - 35‰ Sea surface temperatures are at a maximum in December-February (28.4°C) and are lowest in June-August (26.1°C). During summer, winds blow from west north-west (north-west monsoon) in the area of the Arafura Sea between 4°-10°S (Beaufort force 1.5-4.4). Off the coast of Australia, the wind direction is north north-west (Beaufort force 1.5-2.4). During winter, the south-east monsoon winds blow with equal strength across the whole Arafura Sea. Surface currents in the Arafura Sea north of 8°S have irregular directions and are generally unsteady. South of this latitude, the currents are predominantly westward running at 10-12 nautical miles per day (n mi/day) during winter. In summer the currents have no general directions; in the south-west and south-east parts of the sea, the currents are directed outward, into the Indian Ocean and the Coral Sea respectively. A current system revolves counterclockwise around 10°S, 136°E. Speeds do not exceed 10 n mi/day. Tidal ranges in the Arafura Sea reach 4.5 m at springs on the coast of Irian Jaya and 2.5 m at Dobo, Aru Islands. Maximum tidal currents off the Irian coast reach 4.6 n mi/day toward the north north-west. Off the Australian coast, tidal currents of 5-10 n mi/day occur (Tjia 1966).

PREVIOUS WORK

The first scientific collections of fishes from the Arafura Sea were made by H.M.S. *Challenger* in September 1874 (Stations 188, 190, 191). In reports on the fishes collected by the *Challenger*, Günther (1878, 1880, 1887, 1889) recorded 40 species from the Arafura Sea, including 13 species which he described as new. Apart from a few scattered records there has been little further contribution to our knowledge of the fish fauna of the Arafura Sea.

Exploratory fishing surveys in the Arafura Sea and Gulf of Carpentaria were carried out by research vessels of the Soviet Union between 1967-70 and up to 300 species recorded (Shuntov 1971). Unfortunately, except for listing some of the more common trawl species (Shuntov 1971), the Soviet records are unpublished and their specimens are unavailable.

Extensive exploratory fishing in northern Australia was also undertaken by Taiwanese vessels during the early 1970's. Wei *et al.* (1972) recorded 111 species from trawls made by the Taiwanese research vessel *Hai Ching* in the Arafura sea from March to May 1972. Specimens of species reported by this survey could not be located and are included herein as unconfirmed records.

The United States research vessel *Alpha Helix* visited the Arafura Sea briefly in March 1975 and made a number of midwater and bottom trawls. Some of the fishes collected from these trawls are in the Australian Museum, and include at least one new species recently described by Castle and Paxton (1984).

Two exploratory trawl surveys of the shelf waters of the Arafura Sea and Gulf of Carpentaria were carried out by the Commonwealth Scientific and Industrial Organisation's (CSIRO) chartered research vessel FRV *Soela* in 1980-81 (Okera and Gunn 1986). These cruises resulted in some 320 species being recorded from the Arafura Sea, excluding the Gulf of Carpentaria (Sainsbury *et al.* 1985).

The present list of species is based primarily on specimens collected during a 3 year study of the by-catch of demersal trawl fish assemblages of the Arafura Sea (Russell and Houston, in prep.). This work, begun in 1985, involved the collection of many thousands of specimens, representative material of which is deposited in the Northern Territory Museum (NTM). Other recent collections of fishes were obtained from prawn trawlers operating in deep shelf waters and on the continental slope north of Bathurst Island and Melville Island. Offshore collections of fishes from the Arafura Sea now include over 650 lots and more than 1500 specimens in the NTM.

METHODS

Species records for offshore fishes of the Arafura Sea are included as a checklist (Appendix 1). The checklist is arranged by family and generally follows the phylogenetic arrangement proposed for elasmobranch fishes by Compagno (1973) and for teleosts by Greenwood *et al.* (1966), except where recent work indicates inclusion (e.g. Synanceiidae in Scorpaenidae) or separation (e.g. Harpadontidae from Synodontidae) of families. Spelling of family names follows emendations suggested by Steyskal (1980). Under each family the species are arranged alphabetically by genus and species, together with the name of the original author.

Unless otherwise indicated, species records are based on specimens in the NTM or field records (indicated by FR) from trawl samples (Russell and Houston, in prep.). Other records are indicated in parentheses following the species citation. Species in the Australian Museum, Sydney, are indicated by AMS; species recorded by Sainsbury *et al.* (1985) are indicated by CSIRO; records by other authors are cited in full and are included in the references. Every effort was made to confirm species identifications and records. For some unidentified species, the 6 digit CSIRO species code used by Sainsbury *et al.* (1985) is included in parentheses following the genus name to assist with future identification. Questionable or unconfirmed records are indicated by a question mark (?) before the record; uncertain identifications are indicated by a question mark following the species citation. Where necessary, nomenclatural or taxonomic remarks are enclosed by square brackets following the family or species record. Annotations to the checklist include method of capture, indication of species taken by Taiwanese and Thai vessels, and indication of species taken by commercial fishing vessels as catch or discards. Because discard practices varied from vessel to vessel, particularly between Taiwanese and Thai vessels, we regarded catch as species that were retained by some or all vessels, and discards as species that were trashed by all vessels.

TAXONOMIC COMPOSITION OF THE FISH FAUNA

The fish fauna of the Arafura Sea includes 527 species from 141 families (Tables 1, 2, Appendix 1). The great majority of fishes (111 families, 481 species) are shallow-water, benthic forms that typically inhabit depths down to about 100m. These shorefish families are distributed widely throughout the tropical Indo-Pacific (Springer 1982). The remaining families are mainly deeper water and epipelagic forms, most of which have widespread Indo-Pacific or cosmopolitan distributions.

A few families dominate the fish fauna of the Arafura Sea (Table 1), and the 10 most speciose families (Carangidae, Lutjanidae, Carcharhinidae, Leiognathidae, Nemipteridae, Platycephalidae, Serranidae, Scorpaenidae, Mullidae, Bothidae) together contain about 34% of the total number of species. Three endemic families (Tetrabrachiidae, Leptobramidae, Rhinoprenidae) are known from northern Australia (Wilson and Allen 1987), and two of these (Tetrabrachiidae, Leptobramidae) are recorded from the Arafura Sea.

Comparison With Other Areas

Family composition. The number of fish families from the Arafura Sea is similar to that of the North-west Shelf, and is greater than the number of families reported for other tropical areas of northern Australia, including coral reef areas (Table 2). In part the high number of families for the Arafura Sea is due to the inclusion of deep water and oceanic families, but even excluding these groups, the number of shorefish families represented in the Arafura Sea (111) is high compared with other areas.

The number of families in other areas that are shared with the Arafura Sea is high (Table 2), largely reflecting common faunal origins. Greatest similarity is seen between the Arafura Sea and the south-eastern Gulf of Carpentaria (92%), Gulf of Papua (85.7%) and the North-west Shelf (82.1%). Similarity in overall family composition is somewhat less for coastal Queensland (72.2%), the southern Great Barrier Reef (71.3%) and Rowley Shoals/Scott Reef (68.8%).

Differences in family composition also are seen in a comparison of the most speciose families from various areas of northern Australia (Table 1). The Arafura Sea and North-west Shelf show greatest similarity in family composition, with 8 of 10 dominant families being the same. However, only 3 of the 10 dominant families in the south-eastern Gulf of Carpentaria, and 4 of the 10 dominant families in Queensland and the Gulf of Papua are dominant also in the Arafura Sea. Differences in family composition are even more marked for the southern Great Barrier Reef and Rowley Shoals/Scott Reef, where only 1 of 10 dominant families is dominant also in the Arafura Sea.

These differences in family composition suggest that the fish fauna of tropical northern

Table 1. Comparison of the composition of the 10 most speciose fish families (and No. species in each family) from the Arafura Sea with the most speciose families from the N. W. Shelf[1], S. Gulf of Carpentaria[2], Gulf of Papua[3], Coastal Queensland[4], S. Great Barrier Reef[5], and Rowley Shoals/Scott Reef[6].

Arafura Sea	N.W. Shelf	S. Gulf of Carpentaria	Gulf of Papua	Coastal Queensland	S. Great Barrier Reef	Rowley Shoals/ Scott Reef
Carangidae (38)	Carangidae (43)	Carangidae (21)	Carangidae (29)	Scorpaenidae (23)	Gobiidae (104)	Gobiidae (90)
Lutjanidae (21)	Serranidae (28)	Clupeidae (13)	Scorpaenidae (17)	Carangidae (17)	Labridae (69)	Pomacentridae (65)
Carcharinidae (19)	Scorpaenidae (24)	Scorpaenidae (12)	Clupeidae (15)	Bothidae (16)	Pomacentridae (69)	Labridae (59)
Leiognathidae (16)	Bothidae (22)	Apogonidae (12)	Sciaenidae (14)	Tetraodontidae (13)	Blenniidae (40)	Apogonidae (43)
Nemipteridae (16)	Carcharhinidae (21)	Leiognathidae (12)	Ariidae (13)	Platycephalidae (12)	Apogonidae (33)	Serranidae (32)
Platycephalidae (15)	Nemipteridae (20)	Gobiidae (12)	Engraulididae (12)	Apogonidae (11)	Serranidae (32)	Chaetodontidae (29)
Serranidae (15)	Apogonidae (19)	Soleidae (12)	Tetraodontidae (12)	Callionymidae (8)	Chaetodontidae (32)	Blenniidae (26)
Scorpaenidae (14)	Playcephalidae (18)	Ariidae (11)	Leiognatbidae (11)	Monacanthidae (7)	Acanthuridae (25)	Muraenidae (23)
Mullidae (14)	Labridae (18)	Sciaenidae (9)	Lutjanidae (11)	Triacanthoididae (7)	Muraenidae (23)	Holocentridae (22)
Bothidae (13)	Lutjanidae (17)	Tetraodontidae (9)	Apogonldae (10)	Triglidae (7)	Scaridae (22)	Acanthuridae (21)

[1] Data from Sainsbury *et al.* (1985: pp 328-350, regions A + B).

[2] Data from Rainer and Munro (1982: Accessory Publication).

[3] Data from Kailola and Wilson (1978: pp 23-37).

[4] Data from Cannon *et al.* (1987: Appendix II).

[5] Data from Russell (1983: Table 1).

[6] Data from Allen and Russell (1986).

Australia is not homogeneous. Broad variation between areas can be interpreted largely in terms of geographic and environmental factors. The North-west Shelf and Arafura Sea are similar, more or less continuous, open shelf environments. Their fish faunas are typical of offshore waters and both areas are dominated by carangids, lutjanids, carcharhinids, nemipterids, platycephalids, serranids, scorpaenids and bothids. The Gulf of Carpentaria and Gulf of Papua on the other hand contain extensive shallow areas that are subject to wide ranges of temperature and salinity, and their fish faunas comprise a mixture of euryhaline, semidiadromous and marine species (Kailola and Wilson 1978; Rainer and Munro 1982; Rainer 1984). Families that characterise these gulf areas include carangids, clupeids, scorpaenids, apogonids, leiognathids, ariids, sciaenids, and tetraodontids. Coastal Queensland differs from other shelf areas in that it is a sheltered, inner shelf environment, largely enclosed by the Great Barrier Reef. Dominant families characteristic of coastal Queensland include scorpaenids, carangids, bothids, tetraodontids, platycephalids and apogonids, as well as several groups (callionymids, monacanthids, triacanthoidids and triglids) that are not dominant elsewhere. The Great Barrier Reef and Rowley Shoals/Scott Reef represent coral reef environments that are markedly different to those of soft-bottom shelf waters. Dominant families that jointly characterise coral reef areas include gobiids, labrids, pomacentrids, blenniids, apogonids, serranids, chaetodontids, and acanthurids. With the exception of apogonids and serranids, these fishes are rare on soft-bottoms.

Species composition. The number of species recorded for the Arafura Sea (527) is less than for the North-west Shelf (666), but is greater than for the south-eastern Gulf of Carpentaria (341 species), Gulf of Papua (355 species) and Queensland (285 species). In terms of species composition, nearly half the species recorded from the North-west Shelf (48.8%) and the south-eastern Gulf of Carpentaria (47.2%) are shared with the Arafura Sea, while only about one third of species from coastal Queensland (33%) are shared with the Arafura Sea, suggesting greater faunal affinity between northern and north-western Australia than between northern and north-eastern Australia. Faunal similarity between the Arafura Sea and the Gulf of Papua (15.5%) is very low, perhaps due to a strong fluvial influence in the Gulf of Papua and the presence of many typically euryhaline species.

Not unexpectedly, there is little similarity in species composition of Arafura Sea fishes and fishes of Rowley Shoals/Scott Reef (4.8%) and the southern Great Barrier Reef

Table 2. Comparison of the family and species composition of the fish fauna of the Arafura Sea with fish faunas of the N.W. Shelf[1], S. Gulf of Carpentaria[2], Gulf of Papua[3], Coastal Queensland[4], S. Great Barrier Reef[5], and Rowley Shoals/Scott Reef[6].

	Arafura Sea	N.W. Shelf	S. Gulf of Carpentaria	Gulf of Papua	Coastal Queensland	S. Great Barrier Reef	Rowley Shoals/ Scott Reef
No. families[7]	141	134	88	84	97	108	77
No. shared families	-	110	81	72	70	77	53
Percent families shared[8]	-	82.1	92	85.7	72.2	71.3	68.8
No. species	527	666	341	355	285	859[9]	688
No. shared species	-	325	161	55	94	99	33
Percent species shared[8]	-	48.8	47.2	15.5	33	11.5	4.8

[1] Data from Sainsbury *et al.* (1985: pp 328-350, regions A + B).
[2] Data from Rainer and Munro (1982: Accessory Publication).
[3] Data from Kailola and Wilson (1978: pp 23-37).
[4] Data from Cannon *et al.* (1987: Appendix II).
[5] Data from Russell (1983).
[6] Data from Allen and Russell (1986).
[7] No. families of other authors adjusted in some cases to reflect recent nomenclatural changes.
[8] Percent families/species shared = $n_c/n_x * 100$, where n_c is the number of families/species in common with the Arafura Sea, and n_x is the number of species in the area being compared.
[9] Estimated total number of species for the whole Great Barrier Reef is 1300 (Russell, 1983).

(11.5%). The higher proportion of species in common with the southern Great Barrier Reef is due largely to inclusion of some trawl fishes among species recorded from this area. Jones and Derbyshire (1988) also found little similarity between fish species of the Great Barrier Reef and trawled fishes from coastal Queensland, and concluded that coral reef fish faunas are largely discrete from those of the adjacent benthic environment. This appears to be true also of Arafura Sea fishes: only 6.3% of Arafura Sea fishes occurred also at Rowley Shoals/Scott Reef. The occurrence of reef-associated species on soft-bottoms appears to be largely due to the presence of encrusting epifauna. On the North-west Shelf, some typical reef fishes (e.g. *Lethrinus*, *Lutjanus*) tend to be associated with sponge/gorgonian-dominated habitats (Sainsbury 1987), and similar associations of reef fishes with sponge bottoms have been reported in the tropical W. Atlantic (Collette and Rützler 1977).

Information which we present here deals only with fishes from offshore localities of the Arafura Sea and does not include data on depth distributions. However, variation in species composition between nearshore, shallow offshore, and deep offshore soft-bottom benthos areas, has been reported for both the Gulf of Carpentaria (Rainer and Munro 1982) and the Great Barrier Reef (Cannon *et al.* 1987), though differences between the assemblages were not clear-cut. Blaber *et al.* (1985) on the other hand found virtually no overlap in the inshore fish fauna of the Dampier region with deeper waters of the North-west Shelf. We would expect that more detailed study of patterns of distribution of Arafura Sea fishes will reveal similar cross-shelf differences in fish assemblages.

ZOOGEOGRAPHIC AFFINITIES

Indo-West Pacific. The fish fauna of tropical continental shelves shows a remarkable consistency, and many of the same families are represented over similar bottom types and in similar water masses throughout the tropics (Longhurst and Pauly 1987).

In terms of family composition, the fish fauna of the Arafura Sea shows strong similarities to that of other areas of the Indo-West Pacific such as the Andaman Sea and the Gulf of Thailand, prior to heavy exploitation (Pauly 1979). The dominant fish families of these areas and the Arafura Sea are typical of fish assemblages which occur on sandy offshore grounds in depths of 50-100m (Longhurst and Pauly 1987).

At the species level, there are also indications of similarities, with many species that occur in the Andaman Sea and Gulf of Thailand occurring also in the northern Australia. However, the taxonomic information available on demersal fish assemblages elsewhere is insufficient to make any detailed comparison with the Arafura Sea.

Australia. The fishes of the Arafura Sea have been included by Australian zoogeographers as part of the Dampierian faunal Province (Hedley 1926; Whitley 1932), an area which extends from Houtman's Abrolhos to Torres Strait. The Dampierian Province has been generally accepted by most workers (Bennett and Pope 1953; Knox 1963), although Endean (1957) concludes that it is doubtful whether separation of the Dampierian Province and Solanderian Province, which includes coastal Queensland (Banksian Province of Whitley 1932), is justified.

In a recent review of marine zoogeographic zones, Wilson and Allen (1987) found faunistic differences between the east and west coasts of northern Australia: on the eastern coast of Queensland there is a western Pacific element not present on the North-west Shelf, while conversely on the North-west Shelf there are a number of Indian Ocean and Indo-Malay species present which do not occur in Queensland. They also found significant endemicity (about 13% of species) in the fishes of northern Australia, with about 40% of the endemics restricted to the east coast and Great Barrier Reef, 30% from seas west of Cape York, and 30% widespread across northern Australia. However, they concluded that the faunal distinction between east and west appears to be mainly ecological (*i.e.* greater coral reef development in the north-east), although they conceded historical factors also are involved. Prior to the last Pleistocene flooding of the shelf area between Australia and Papua New Guinea, the North-west Shelf and the Queensland Shelf must have been relatively isolated from each other for long periods, this leading to faunistic differences (Wilson and Allen 1987).

Our comparison of family and species composition of Arafura Sea fishes with the fish faunas of other areas of northern Australia generally agrees with that of Wilson and Allen (1987), and indicates greater faunistic affinity with the North-west Shelf than with coastal Queensland. However, many fish species are widely distributed across northern Australia and the distinction between the faunas of the North-west Shelf and Arafura Sea, and coastal Queensland is not clear-cut. Evidence from other studies (Rainer and Munro 1982; Sainsbury 1987; Longhurst and Pauly 1987) indicates that environmental factors such as the type of bottom deposits, occurrence of reefs, brackish and estuarine conditions, water depth, and differences in water masses are important determinants of species composition of demersal fish assemblages. We suggest that such environmental factors have had, and continue to have, a major influence in determining faunal differences between areas of northern Australia, and that these differences have largely overridden past vicariance events. For this reason, we draw short of recognising distinct zoogeographic regions for northern Australia.

IMPORTANCE TO FISHERIES.

Of the 527 species recorded (Appendix 1), 491 (93.2%) were taken by bottom trawl or dredge; 44 (8.3%) by gillnet; 19 (3.6%) by longline; 3 (0.6%) by handline; 4 (0.8%) were from deck strandings (all flying fishes, family Exocoetidae); and 1 (0.2%) by midwater trawl. While not all of the above categories are mutually exclusive, and some species were taken by more than one method, the overwhelming preponderance of species taken by trawling largely reflects the very high diversity of bottom-living fishes in the Arafura Sea.

Some 231 species were recorded from trawl samples taken from Taiwanese and Thai vessels operating in the Arafura Sea (Appendix 1, indicated by the symbol + after method of capture). Including species taken by also by gill net and handline, 108 species (20.5% of total species) are retained as catch (Appendix 1, shown in bold type) by commercial vessels. The remaining by-catch species that occur in commercial catches are discarded as trash. Based on their utilisation in fisheries elsewhere (Fischer and Bianci 1984), we have identified 163 discarded species (30.9% of total species) that are potentially useful for food (fresh, in fish cakes, or salted and dried), bait, or processing as fish meal and petfood (Appendix 1, indicated by an asterisk after method of capture). Whether or not utilisation of these by-catch species is likely to be economically viable, however, remains to be investigated.

Table 3. Dominant species taken by commercial trawlers in the Arafura Sea ranked in order of their contribution to the mean total catch biomass (%). Only species contributing ≥ 1% of total biomass are included. Discarded species are shown in **bold** type; other species are retained as catch. Data from Houston and Russell (in prep.).

Species	% of catch biomass
Lutjanus malabaricus Schneider	15.13
Nemipterus hexodon (Quoy and Gaimard)	6.60
Arius thalassinus (Rüppell)	4.73
Priacanthus tayenus Richardson	3.98
Nemipterus furcosus (Valenciennes)	3.88
Psenopsis anomala (Temminck and Schlegel)	3.87
Lethrinus lentjan (Lacepède)	3.76
Saurida micropectoralis Shindo and Yamada	3.49
Lutjanus erythropterus (Bloch)	2.77
Diagramma pictum (Thunberg)	2.74
Carcharhinus dussumieri (Müller and Henle)	2.63
Sphyraena putnamiae Jordan and Seale	1.65
Lutjanus vitta (Quoy and Gaimard)	1.63
Carangoides caeruleopinnatus (Rüppell)	1.57
Carangoides talamparoides Bleeker	1.49
***Terapon theraps* (Cuvier)**	**1.47**
Carangoides malabaricus (Bloch and Schneider)	1.30
Selar boops (Cuvier)	1.29
Priacanthus macracanthus Cuvier	1.28
Saurida sp. 2 (118016)	1.22
Rastrelliger kanagurta (Cuvier)	1.22
Nemipterus nematopus (Bleeker)	1.17
***Sargocentron rubrum* (Forsskål)**	**1.08**
Total	69.95

Quantitative analysis of trawl catches (Russell and Houston, in prep.) shows the great majority of fish species in the Arafura Sea occur in relatively small numbers, and that most species individually contribute less than 1% of the mean total catch biomass. Only 23 species (Table 3) were abundant enough in trawl samples to individually contribute 1% or more of the mean total catch biomass. This small group of species comprises only 4.4% of total species, but are dominant in catches and together comprise 70% of the mean total catch biomass of the demersal trawl fishery.

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APPENDIX 1.
Checklist of fish species recorded from offshore in the Arafura Sea.

Species are arranged in systematic order by family. Numbers in parentheses following the genus name for some unidentified species refer to the CSIRO species code used by Sainsbury *et al.* (1985). Questionable or unconfirmed records are indicated by a ? before the record; uncertain identifications are indicated by a ? following the species citation. Nomenclatural or taxonomic remarks are enclosed by square brackets following the family or species record. Records are based on specimens in the Northern Territory Museum, unless otherwise indicated. For abbreviations used for species records see Methods. Species retained in commercial catches are indicated in bold type; species taken by Taiwanese and Thai trawlers are indicated by a + symbol following method of capture; potentially important trawl species, presently discarded, are indicated by a * symbol following method of capture. Annotations indicate method of capture (BT, bottom trawl or dredge; GN, gill net; LL, longline; HL, handline; MT, midwater trawl; SD, stranded on deck; -, unknown).

FAMILY/Genus/species/author [Remarks]	Record	Method of capture
SQUALIDAE		
Squalus japonicus Ishikawa?		BT
ODONTASPIDIDAE		
Eugamphodus taurus (Rafinesque)		**LL**
PSEUDOCARCHARIIDAE		
?*Pseudocarcharius kamoharai* (Matsubara)	(Wei *et al.* 1972)	BT
[Recorded by Wei *et al.* (1972) as *Carcharius yangi* Teng, a junior synonym of *P. kamaharai* according to Compagno (1984)]		
ORECTOLOBIDAE		
Chiloscyllium punctatum Müller and Henle		BT+
Eucrossorhinus dasypogon (Bleeker)		BT+
Nebrius concolor Rüppell	(CSIRO)	BT
Stegostoma varium (Seba)	(CSIRO)	BT
SCYLIORHINIDAE		
Atelamycterus sp. (015005)		BT
Halaelurus sp. 1 (015004)		BT
LAMNIDAE		
?*Isurus oxyrinchus* Rafinesque	(Wei *et al.* 1972)	BT,GN
CARCHARHINIDAE		
Carcharhinus amblyrhynchoides (Whitley)	**(CSIRO)**	**GN**
C. amblyrhynchos (Bleeker)	(CSIRO)	BT*
C. amboinensis (Müller and Henle)	**(CSIRO)**	**GN**
C. brevipinna (Müller and Henle)	**(CSIRO)**	**GN,LL**
C. cautus (Whitley)	(CSIRO)	BT*
C. dussumieri (Müller and Henle)		**BT+,GN**
C. fitzroyensis (Whitley)	**(CSIRO)**	**BT,GN**
C. limbatus (Müller and Henle)	**(CSIRO)**	**BT,GN,LL**
C. maclati (Müller and Henle)	**(FR)**	**BT+,GN, LL**
C. melanopterus (Quoy and Gaimard)	**(CSIRO)**	**BT,GN**
C. obscurus (Lesueur)	**(CSIRO)**	**BT,LL**
C. plumbeus (Nardo)	**(CSIRO)**	**BT,LL**
C. sorrah (Müller and Henle)	**(FR)**	**BT+,GN,LL**
C. tilstoni (Whitley)	**(Stevens and Wiley 1986)**	**BT,LL**
Galeocerda cuvieri (Lesueur)	**(CSIRO)**	**BT,GN,LL**
Negaprion acutidens (Rüppell)	(CSIRO)	BT*
Rhizoprionodon acutus (Rüppell)		**BT+,GN,LL**
R. taylari (Ogilby)		**BT+,GN,LL**
Triaenodon obesus (Rüppell)	(CSIRO)	BT*
HEMIGALEIDAE		
Hemigaleus microstoma Bleeker		**BT+**
Hemipristis elangatus (Klunzinger)	**(CSIRO)**	**BT,GN,LL**
SPHYRNIDAE		
Eusphyra blochii (Cuvier)	**(CSIRO)**	**BT,GN,LL**
Sphyrna lewini (Griffith and Smith)		**BT+,GN,LL**
S. mokarran (Rüppell)	**(CSIRO)**	**BT,GN,LL**
PRISTIDAE		
Pristis cuspidatus Latham	**(CSIRO)**	**BT,GN**
P. microdon Latham	(CSIRO)	BT*
P. zijsron Bleeker	(CSIRO)	BT*
RHYNCHOBATIDAE		
Rhina ancylostoma Bloch and Schneider	(CSIRO)	BT*
Rhyncobatus djiddensis (Forsskål)		**BT+**
RAJIDAE		
Raja sp.		BT
TORPEDINIDAE		
Narcine sp.		BT+
DASYATIDIDAE		
Amphostistius sp. 3 (035014)		BT
Dasyatis annatatus Last		BT+
D. kuhlii (Müller and Henle)		BT+
[Record of '*Trygon pastinaca* L.' by Günther (1880) probably refers to this species]		
D. leylandi Last		BT+
D. sephen (Forsskål)		BT
Himantura uarnak (Forsskål)		BT+
[*H. toshi* Whitley recorded from the Arafura Sea by Whitley (1940) is a junior synonym of *H. uarnak* according to Taylor (1964)]		
GYMNURIDAE		
Aetoplatea sp.		BT
Gymnura australis (Ramsay and Ogilby)		BT+
MYLIOBATIDIDAE		
Aetomyleus nichofii (Bloch and Schneider)		BT+
MOBULIDAE		
Mobula diabola Fowler		GN
CHIMAERIDAE		
Hydrolagus sp. (042004)		BT
ELOPIDAE		
Elops australis Regan	(Lyle and Timms 1984)	GN
MEGALOPIDAE		
Megalops cyprinoides (Broussonet)		BT+,GN*
ALBULIDAE		
Albula neoguinaica Valenciennes		BT+*
NEMICHTHYIDAE		
Nemichthys scolopaceus Richardson		BT
MURAENIDAE		
Gymnothorax sp. 1 (060004)	(CSIRO)	BT

MURAENESOCIDAE

Muraenesox bagio (Hamilton-Buchanan)		BT+
M. cinereus (Forsskål)		BT+

NETTASTOMATIDAE

Saurenchelys sp. (065001)	(CSIRO)	BT

CONGRIDAE

Lumiconger orafura Castle and Paxton	(CSIRO)	BT
Rhynchoconger sp. (067001)	(CSIRO)	BT
Coloconger raniceps Alcock?		BT

OPHICHTHIDAE

Muraenichthys sp.		BT+
Neenchelys retropinna Smith and Böhlke	(Smith and Böhlke 1983)	BT

CLUPEIDAE

Amblygaster sirm (Walbaum)	(FR)	BT+*
Anodontostoma chacunda (Hamilton-Buchanan)	(CSIRO)	BT*
Dussumieria elopsoides Bleeker		BT+*
?Etrumeus teres (De Kay)?	(Wei *et al.* 1972)	BT
[Recorded by Wei *et al* (1972) as *Etrumeus micropus* (Temminck and Schlegel) a junior synonym of *E. teres* - Whitehead (1985)]		
Herklotsichthys koningsbergeri (Weber and Beaufort)	(CSIRO)	BT*
H lippa (Whitley)		BT+*
Ilisha lunula Kailola	(CSIRO)	BT*
?I. melastoma (Bloch and Schneider)	(Wei *et al.* 1972)	BT
[Recorded by Wei *et al* (1972) as *Illisha indica* (Swainson), a junior synonym of *I melastoma* - Whitehead (1985)]		
Pellona ditchela Valenciennes	(FR)	BT+*
Sardinella albella (Valenciennes)		BT+*
S. gibbosa (Bleeker)	(CSIRO)	BT*

ENGRAULIDIDAE

Papuengraulis micropinno Munro	(CSIRO)	BT*
Setipinna tenuifilis Valenciennes	(CSIRO)	BT*
Stolephorus indicus (van Hasselt)		BT+*
Thryssa hamiltonii (Gray)	(CSIRO)	BT*
T setirostris (Broussonet)	(CSIRO)	BT*

CHIROCENTRIDAE

***Chirocentris dorob* (Forsskål)**		BT+,GN

GONOSTOMATIDAE

Cyclothone sp.	(AMS)	MT
Gonostoma elongatum Günther	(Günther 1878)	–

CHAULIODONTIDAE

Chauliodus sloanii Bloch and Schneider	(Günther 1887)	–

ALEPOCEPHALIDAE

Alepocephalus sp.?		BT
Bajacalifornia sp.		BT
Talismania filamentosa Okamura and Kawanishi?		BT

SYNODONTIDAE

Synodus sageneus Waite	(CSIRO)	BT
[Record of *Saurus intermedius* Agassiz by Günther (1880) probably also refers to this species according to Whitley (1943)]		
S. tectus Cressey		BT+
[Record of *Synodus similis* McCulloch from the Arafura Sea by Munro (1957a) probably is based on a misidentification of *S. tectus*.]		
Trachinocephalus myops (Bloch and Schneider)	(CSIRO)	BT

HARPADONTIDAE

[Assignment of *Saurida* to this family follows Johnson (1982)]

Harpadon translucens Saville-Kent	(CSIRO)	BT*
Saurida longimanus Norman		BT+*
***S. micropectoralis* Shindo and Yamada**		BT+
?S. tumbil (Bloch)	(Wei *et al.* 1972)	BT
S undosquamis (Richardson)		BT*
[Also recorded as *S grandisquamis* Günther by Günther (1880)]		

S. sp. 1 (118006)		BT+*
***S.* sp. 2 (118016)**		BT+

CHLOROPHTHALMIDAE

Chlorophthalmus sp. (120005)	(CSIRO)	BT

PARALEPIDIDAE

Stemnosudis rothschildi Richards		BT

MORIDAE

Physiculus nigrescens Smith and Radcliffe	(Paulin 1989)	BT
P. roseus Alcock?		BT

GONORHYNCHIDAE

Gonorhynchus sp. (141002)	(CSIRO)	BT

CHANIDAE

***Chonos chonos* (Forsskål)**	**(FR)**	BT+

ARIIDAE

Arius bilineatus Valenciennes		BT+*
A. leiotetocephalus Bleeker		BT+*
?A. maculatus (Thunberg)	(Wei *et al.* 1972)	BT
***A. tholossinus* (Rüppell)**		BT+
A sp. (188002)	(CSIRO)	BT*

PLOTOSIDAE

Euristhmus lepturus (Günther)		BT+*
E. nudiceps (Günther)		BT+*

BATRACHOIDIDAE

Batrachomoeus trispinosus (Günther)	(CSIRO)	BT*

LOPHIIDAE

Lophiodes naresi (Günther)?		BT
Lophiomus setigerus (Vahl)	(CSIRO)	BT

ANTENNARIIDAE

Antennarius hispidus (Bloch and Schneider)		BT

TETRABRACHIIDAE

Tetrabrachium ocellotum Günther		BT+

CHAUNACIDAE

Chaunax pictus Lowe?		BT

OGCOCEPHALIDAE

Dibranchus sp.?		BT
Halieutaea indica Annandale and Jenkins		BT+
H. stellata (Vahl)	(CSIRO)	BT

BREGMACEROTIDAE

Bregmaceros japonicus Tanaka?		BT
B macclellandi Thompson	(CSIRO)	BT

OPHIDIIDAE

Hoplobrotula armota (Temminck and Schlegel)	(CSIRO)	BT
Sirembo imberbis (Temminck and Schlegel)		BT+

CARAPIDAE

Onuxodon margaritiferae (Rendahl)		BT+

MACROURIDAE

Coelorinchus sp.		BT
Hymenocephalus sp.		BT

EXOCOETIDAE

Cheilopogon cyanopterus (Valenciennes)		SD
Cypselurus poecilopterus (Valenciennes)	(Munro 1957b)	–
Hirundichthys oxycephalus (Bleeker)		SD
Parexocoetus brachypterus (Richardson)	(Paradice and Whitley 1927)	SD
P. mento (Valenciennes)		SD

MELAMPHAIDAE

Scopelogadus mizolepis (Günther)	(Günther 1878)	–
[Described as *Scopelus mizolepis* Günther (1878) and recorded as *Melamphoeus mizolepis* by Günther (1887)]		

DIRETMIDAE

Diretmoides parini Post and Quero		BT

TRACHICHTHYIDAE		
Hoplostethus melanopus (Weber)		BT
H. melanopterus Fowler		BT
MONOCENTRIDIDAE		
Monocentris japonicus (Houttuyn)	(CSIRO)	BT
HOLOCENTRIDAE		
?Myripristis murdjan (Forsskål)	(Wei *et al*. 1972)	BT
Sargocentron rubrum (Forsskål)		BT+*
CAPROIDAE		
Antigonia rubescens (Günther)		BT
A. rhomboidea McCulloch	(CSIRO)	BT
VELIFERIDAE		
Velifer hypselopterus Bleeker		BT+
FISTULARIIDAE		
Fistularia petimba Lacepède		BT+*
CENTRISCIDAE		
?Aeoliscus strigatus (Günther)	(Wei *et al*. 1972)	BT
Centriscus scutatus Linnaeus	(CSIRO)	BT
SYNGNATHIDAE		
Hippocampus histrix Kaup		BT
Solegnathus lettiensis Bleeker	(CSIRO)	BT
Trachyrhamphus longirostris Kaup	(AMS)	BT
SCORPAENIDAE		
Apistops caloundra (De Vis)	(CSIRO)	BT
Apistus carinatus (Bloch and Schneider)	(CSIRO)	BT
Bruchypterois serruluta (Richardson)		BT+
Cottapistus cottoides (Linnaeus)		BT+
Dendrochirus brachypterus (Cuvier)		BT
Erosa erosa (Langsdorf)		BT+
Inimicus sinensis (Valenciennes)		BT+
Minous pictus Günther	(Günther 1880)	BT
Neomerinthe sp.		BT+
Pterois russelli Bennett		BT+
Scorpaenodes smithi Eschmeyer and Rama Rao		BT+
Scorpaenopsis cirrhosa (Thunberg)	(CSIRO)	BT
Sebastapistes amplisquamiceps (Fowler)	(AMS)	BT
Setarches longimanus (Alcock)	(CSIRO)	BT
TRIGLIDAE		
Gargariscus prionocephalus (Dumeril)		BT*
Lepidotrigla grandis Ogilby	(CSIRO)	BT*
?L. punctipectoralis Fowler	(Wei *et al*. 1972)	BT
L. spiloptera Günther	(CSIRO)	BT*
L. sp. 1 (288016)		BT+*
L. sp. 2 (288015)		BT+*
Pterygotrigla hemisticta (Temminck and Schlegel)	(CSIRO)	BT*
P. ryukyuensis Matsubara and Iliyama		BT*
Satyrichthys rieffeli (Kaup)	(CSIRO)	BT*
S. welchi (Herre)		BT*
APLOACTINIDAE		
Xenaploactis sp.		BT+
PLATYCEPHALIDAE		
Bembras japonicus Cuvier	(CSIRO)	BT*
Elates ransonneti (Steindachner)		BT+*
?Grammoplites scaber (Linnaeus)	(Wei *et al*. 1972)	BT
Inegocia harrisii (McCulloch)		BT*
I. japonica (Tilesius)	(CSIRO)	BT*
[Previously recorded by CSIRO as *Suggrundus isacanthus* (Cuvier)]		
Platycephalus endrachtensis Quoy and Gaimard	(CSIRO)	BT*
P. indicus (Linnaeus)	(CSIRO)	BT*
P. malabaricus Cuvier?	(Günther 1880)	BT*
P. sculptus Günther	(Günther 1880)	BT*
Rogadius asper (Cuvier)		BT+*
R. pristiger (Cuvier)	(Knapp 1987)	BT*
Suggrundus bosschei (Bleeker)	(CSIRO)	BT*
S. macracanthus (Bleeker)		BT+*
S. rodricensis (Cuvier)		BT+*
S. sp. 1 (296018)		BT+*
PSYCHROLUTIDAE		
Psychrolutes sp.		BT
DACTYLOPTERIDAE		
Dactyloptena macracanthus (Bleeker)		BT+
D. orientalis (Cuvier)	(CSIRO)	BT
D. papilio Ogilby		BT+
?D. peterseni (Nystrom)	(Wei *et al*. 1972)	BT
CENTROPOMIDAE		
Psammoperca waigiensis Cuvier	(CSIRO)	BT*
SERRANIDAE		
Centrogenys vaigiensis (Quoy and Gaimard)	(CSIRO)	BT
Cephalopholis boenack (Bloch)		BT+*
?C. sexmaculatus (Rüppell)	(Wei *et al*. 1972)	BT
[Recorded by Wei *et al*. (1972) as *Cephalopholis coatesi* Whitley, a junior synonym of *C. sexmaculatus*]		
Epinephelus amblycephalus (Bleeker)		BT*
***E. areolatus* (Forsskål)**		**BT+**
?E. diacanthus (Valenciennes)	(Günther 1880)	BT*
***E. epistictus* (Temminck and Schlegel)**	**(FR)**	**BT+**
E. fasciatus (Forsskål)	(CSIRO)	BT*
***E. heniochus* Fowler**		**BT+**
E. morrhua (Valenciennes)		HL
E. quoyanus (Valenciennes)		BT*
***E. sexfasciatus* (Valenciennes)**		**BT+**
***E. suillus* (Valenciennes)**	**(FR)**	**BT+**
Plectranthias japonicus (Steindachner)	(CSIRO)	BT
***Plectropomus maculatus* (Bloch)**		**BT+**
PSEUDOCHROMIDAE		
Pseudochromis quinquedentatus (McCulloch)		BT+
GLAUCOSOMATIDAE		
Glaucosoma magnificum (Ogilby)	(CSIRO)	BT*
TERAPONTIDAE		
Pelates quadrilineatus (Bloch)	(CSIRO)	BT*
Terapon jarbua (Forsskål)		BT+*
T. theraps (Cuvier)		BT+*
PRIACANTHIDAE		
?Priacanthus cruentatus (Lacepède)	(Wei *et al* 1972)	BT
P. hamrur (Forsskål)	(CSIRO)	BT*
***P. macracanthus* Cuvier**		**BT+**
***P. tayenus* Richardson**		**BT+**
Pristigenys niphonia (Cuvier)	(CSIRO)	BT*
APOGONIDAE		
Apogon brevicaudatus Weber	(CSIRO)	BT
A. ellioti Day		BT+
[*A. arafurae* Günther recorded by Günther (1880) is a synonym of *A. ellioti* - Weber and Beaufort (1929)]		
A. fasciatus (Shaw in White)		BT+
[This species previously was recorded as *A. quadrifasciatus* Cuvier, a junior synonym (Randall and Lachner 1986). *A. monogramma* Günther also is a junior synonym of *A. fasciatus* - Weber and Beaufort (1929)]		
A. hartzfeldi Bleeker	(CSIRO)	BT
A. melanopus Weber	(CSIRO)	BT
A. nigripinnis Cuvier	(CSIRO)	BT
A. poecilopterus Cuvier		BT+
A. septemstriatus Günther		BT+
Rhabdamia gracilis (Bleeker)		BT+
ACROPOMATIDAE		
[Assignment of genera to this family follows Johnson (1984)].		
Acropoma japonicum Günther	(CSIRO)	BT
Malakichthys elegans Matsubara and Yamaguchi		BT
M. sp. (311031)	(CSIRO)	BT
Synagrops philippinensis (Günther)		BT+
SILLAGINIDAE		
Sillago maculata Quoy and Gaimard	(CSIRO)	BT*
S. lutea McKay	(CSIRO)	BT*
[Previously recorded by CSIRO as *Sillago* sp. 1]		
BRANCHIOSTEGIDAE		
?Branchiostegus japonicus (Houttyn)	(Wei *et al*. 1972)	BT
***B. sawakinensis* Amirthalingam**		**BT+**

LACTARIIDAE		
Lactarius lactarius (Bloch and Schneider)	(CSIRO)	BT*
RACHYCENTRIDAE		
Rachycentran canadus **(Linnaeus)**		**BT+,GN**
ECHENEIDIDAE		
Echeneis naucrates Linnaeus		BT+*
Remora brachyptera (Lowe)		LL
R. remora (Linnaeus)	(Lyle and Timms 1984)	GN
CARANGIDAE		
Ahsalom radiatus (Macleay)	(CSIRO)	BT*
Alectis ciliaris (Bloch)		BT+*
A. indicus (Rüppell)		BT+*
Alepes **sp. (337051)**		**BT+**
?Atule djedaba (Forrskål)	(Wei *et al.* 1972)	BT
A. mate **(Cuvier)**		**BT+**
Carangoides caeruleopinnatus **(Rüppell)**		**BT+**
C. chrysophrys **(Cuvier)**		**BT+**
C. equula (Temminck and Schlegel)	(CSIRO)	BT*
C. fulvoguttatus (Forsskål)	(CSIRO)	BT*
C. gymnostethus (Cuvier)		BT+*
C. hedlandensis **(Whitley)**	**(FR)**	**BT+**
C. humerosus **(McCulloch)**		**BT+**
C. malabarieus **(Bloch and Schneider)**		**BT+**
?C. ohlongus Cuvier	(Wei *et al* 1972)	BT
C. talamparoides **Bleeker**		**BT+**
Caranx bueeulentus **Alleyne and Macleay**		**BT+,GN**
C. ignoblis **(Forsskål)**	**(FR)**	**BT+**
?C. melampygus Cuvier	(Wei *et al.* 1972)	BT
C. sexfasciatus **Quoy and Gaimard**	**(FR)**	**BT+**
C. tille Cuvier	(CSIRO)	BT*
"Caranx" para (Cuvier)	(CSIRO)	BT*
Decapterus macrosoma Bleeker		BT+*
?D muroadsi (Temminck and Schlegel)	(Wei *et al.* 1972)	BT
D. russelli (Rüppell)		BT+*
[also recorded as *D. lajang* Bleeker, a junior synonym, by Wei *et al.* (1972)]		
?Gnathanodon speciosus (Forsskål)	(Wei *et al.* 1972)	GN
Megalaspis cordyla (Linnaeus)	(FR)	BT+*
Scomberoldes commersonianus **Lacepède**	**(Walter 1981)**	**GN**
S. lysan (Forsskål)	(CSIRO)	BT*
S. tala (Cuvier)	(CSIRO)	BT*
S. tol (Cuvier)		BT+*
Selar boaps **(Cuvier)**		**BT+**
S. crumenophthalmus **(Bloch)**		**BT+**
Selaroides leptolepis **(Cuvier)**	**(FR)**	**BT+**
Seriolina nigrofaseiata **(Rüppell)**		**BT+**
Ulua aurachs **(Ogilby)**		**BT+**
?Uraspis helvola (Forster in Bloch and Schneider)	(Wei *et al.* 1972)	BT
U. uraspis **(Günther)**		**BT,BT+**
CORYPHAENIDAE		
Coryphaena hippurus Linnaeus		HL
FORMIONIDAE		
Parastramateus niger **(Bloch)**		**BT+,GN**
MENEIDAE		
Mene maculata (Bloch and Schneider)		BT+*
LEIOGNATHIDAE		
Gazza minuta (Bloch)		BT+*
Leiognathus aureus Abe and Haneda	(CSIRO)	BT*
L. bindus (Valenciennes)		BT+*
L. blachii (Valenciennes)	(CSIRO)	BT*
L. decorus (De Vis)	(CSIRO)	BT*
L. elongatus (Günther)	(CSIRO)	BT*
L. equulus (Forsskål)		BT+*
L. fasciatus (Lacepède)		BT+*
L. leuciscus (Günther)	(CSIRO)	BT*
L. moretaniensis (Ogilby)		BT+*
L. smithursti (Ramsay and Ogilby)	(CSIRO)	BT*
L. splendens (Cuvier)	(CSIRO)	BT*
L. stercorarius Evermann and Seale?		BT+*
L. sp. (341003)	(CSIRO)	BT*
Secutor insidiator (Bloch)		BT+*
S. ruconius (Hamilton-Buchanan)	(CSIRO)	BT*
EMMELICHTHYIDAE		
?Erythrocles schlegelii Richardson	(Wei *et al.* 1972)	BT
CAESIONIDAE		
Caesio cuning **(Bloch)**		**BT+**
?Pterocaesio chrysozona (Cuvier)	(Wei *et al.* 1972)	BT
P digramma (Bleeker)	(FR)	BT+*
LUTJANIDAE		
?Aprion virescens Valenciennes	(Wei *et al.* 1972)	BT
Lutjanus argentimaculatus **(Forsskål)**	**(FR)**	**BT+**
L. carponotatus (Richardson)	(CSIRO)	BT*
L. erythropterus **(Bloch)**		**BT+**
?L. fulviflamma (Forsskål)	(Wei *et al.* 1972)	BT
?L. gibhus (Forsskål)	(Wei *et al.* 1972)	BT
L. johni **(Bloch)**	**(FR)**	**BT+**
?L. kasmira (Forsskål)	(Wei *et al.* 1972)	BT
L. lemniscatus **(Valenciennes)**		**BT+**
?L. lunulatus (Park)	(Wei *et al.* 1972)	BT
L. lutjanus Bloch		BT+*
L. malabaricus **Schneider**		**BT+**
?L. monostigma (Cuvier)	(Wei *et al.* 1972)	BT
L. quinquelineatus **Bloch**		**BT+**
L. rivulatus (Cuvier)		BT+*
L. russelli **(Bleeker)**		**BT+**
L. sebae **(Cuvier)**		**BT+**
L. vitta **(Quoy and Gaimard)**		**BT+**
?Paracaesio xanthurus (Bleeker)	(Wei *et al.* 1972)	BT
?Pristipomoides argyrogrammicus (Valenciennes)	(Wei *et al.* 1972)	BT
P. multidens **(Day)**		**BT+,LL**
NEMIPTERIDAE		
Nemipterus bathybius Snyder	(CSIRO)	BT*
N. eelebicus **(Bleeker)**		**BT+**
N. fureosus **(Valenciennes)**	**(FR)**	**BT+**
N. hexadan **(Quoy and Gaimard)**		**BT+**
N. isacanthus **(Bleeker)**		**BT+**
N. marginatus (Valenciennes)		BT+*
N. nematapus **(Bleeker)**		**BT+**
N. peranii **(Valenciennes)**		**BT+**
N. virgatus **(Houttuyn)**		**BT+**
N. zysran (Bleeker)	(Russell 1986a)	BT*
?Parascolopsis eriomma (Jordan and Richardson)	(Wei *et al.* 1972)	BT
P. rufamaculatus Russell	(Russell 1986b)	BT
Pentapodus parosus (Valenciennes)	(CSIRO)	BT
Scalopsis monogramma (Kuhl and Van Hasselt in Valenciennes)	(FR)	BT+*
[This species has been misidentified by some authors as *S. temporalis*]		
S. taeniopterus **(Kuhl and Van Hasselt in Valenciennes)**		**BT+**
S. vasmeri (Bloch)		BT
GERREIDAE		
Gerres filamentosus Cuvier		BT+*
G. kapas Bleeker?		BT+*
G. subfasciatus Cuvier	(CSIRO)	BT*
Pentaprion longimanus (Cantor)		BT+*
HAEMULIDAE		
Diagramma pietum **(Thunberg)**		**BT+**
Haplogenys kishinouyei Smith and Pope	(CSIRO)	BT*
?Pomadasys argenteus (Forsskål)	(Wei *et al.* 1972)	BT
?P. hasta (Bloch)	(Wei *et al.* 1972)	BT
P. kaakan **(Cuvier)**	**(FR)**	**BT+**
P. maculatum (Bloch)	(CSIRO)	BT*
LETHRINIDAE		
?Gymnocranius griseus (Temminck and Schlegel)	(Wei *et al.* 1972)	BT
G. robinsoni (Gilchrist and Thompson)		BT+*
Lethrinus fraenatus **Valenciennes**		**BT+**
L. kallopterus Bleeker		HL
L. lentjan **(Lacepède)**		**BT+**
?L. mahsenoides Valenciennes	(Wei *et al.* 1972)	BT
?L. miniatus (Forster in Bloch and Schneider)	(Wei *et al.* 1972)	BT
L. nematacanthus Bleeker	(FR)	BT+*
?L. ramak (Forsskål)	(Wei *et al.* 1972)	BT
[Recorded by Wei *et al.* (1972) as *Lethrinus obsaletus* (Forsskål), a junior synonym of *L. ramak* - see Smith (1986)]		

SPARIDAE		
Argyrops spinifer **(Forsskål)**		**BT+**
SCIAENIDAE		
Argyrosomus amoyensis (Bleeker)		BT*
A. **sp. (354012)**		**BT+**
Atrobucca nibe (Jordan and Thompson)		BT*
Austronibea oedogenys Trewavas		BT*
Johnius cottor (Hamilton)	(CSIRO)	BT*
J. vogleri (Bleeker)		BT+*
Protanibea diacanthus **(Lacepède)**		**BT+**
MULLIDAE		
?Parupeneus chryserydros (Lacepède)	(Wei *et al.* 1972)	BT
[This species was recorded as *Parupeneus luteus*, a synonym of *P. chryserydros* - see Kühlmorgen-Hille and Guézé (1974)]		
P. chrysopleuron (Schlegel)		BT+*
P. cinnabarinus **(Cuvier)**		**BT+**
?P. janseni (Bleeker)	(Wei *et al.* 1972)	BT
?P. trifasciatus (Lacepède)	(Wei *et al.* 1972)	BT
Upeneoides sp.	(Günther 1880)	BT*
Upeneus asymmetricus Lachner	(CSIRO)	BT*
U. bensasi (Temminck and Schlegel)		BT+*
U. luzonius (Jordan and Seale)	(CSIRO)	BT*
U. moluccensis (Bleeker)		BT+*
U. sulphureus (Cuvier)		BT+*
U. sundaicus (Bleeker)	(CSIRO)	BT*
U. tragula Richardson	(CSIRO)	BT*
U. sp. (355008)		BT+*
LEPTOBRAMIDAE		
Leptobrama muelleri Steindachner	(Lyle and Timms 1984)	GN
EPHIPPIDIDAE		
Drepane punctata (Linnaeus)	(CSIRO)	GN
?Ephippus orbis (Bloch)	(Wei *et al.* 1972)	BT
Platax batavianus **Cuvier**		**BT+**
P. teira (Forsskål)		BT+*
Zabidius novemaculeatus (McCulloch)		BT+*
CHAETODONTIDAE		
Chaetodon aureofasciatus Macleay	(CSIRO)	BT
C. *modestus* Schlegel	(CSIRO)	BT
?C. unimaculatus Bloch	(Wei *et al.* 1972)	BT
Chelmon marginalis Richardson	(CSIRO)	BT
C. muelleri (Klunzinger)	(CSIRO)	BT
Coradion altivelis McCulloch	(CSIRO)	BT
C. *chrysozonus* (Cuvier)		BT+
Heniochus acuminatus (Linnaeus)		BT+
Parachaetodon ocellatus (Cuvier)		BT+
POMACANTHIDAE		
?Apolemichthys trimaculatus (Cuvier)	(Wei *et al.* 1972)	BT
Chaetodontoplus duboulayi (Günther)		BT+
C. *personifer* (McCulloch)		BT+
Pomocanthus sexstriatus (Cuvier)	(CSIRO)	BT
PENTACEROTIDAE		
Hystiopterus typus Temminck and Schlegel	(CSIRO)	BT*
POMACENTRIDAE		
Pristotis jerdoni (Day)		BT+
CEPOLIDAE		
Owstonia sp.		BT
SPHYRAENIDAE		
Sphyraena farsteri **Cuvier**		**BT+**
S. abtusata **Cuvier**		**BT+**
S. putnamiae **Jordan and Seale**		**BT+**
?S. qenie Klunzinger	(Wei *et al.* 1972)	BT
POLYNEMIDAE		
Eleutheranema tetradactylum **(Shaw)**	**(Lyle and Timms 1984)**	**GN**
Palydactylus multiradiatus **(Günther)**		**BT+**
P nigripinnis Munro	(CSIRO)	BT*
Palynemus sheridani **Macleay**	**(Lyle and Timms 1984)**	**GN**
LABRIDAE		
Choerodon cauteroma Gomon and Allen		BT+*
C. cephalotes (Castlenau)	(CSIRO)	BT*
C. monostigma (Ogilby)		BT+*
C. schoenleinii (Valenciennes)	(CSIRO)	BT*
C. sugillatum Gomon		BT*
Xiphocheilus typus (Bleeker)		BT+
[Also recorded as *X. quadrimaculatus* Günther by Günther (1880) a junior synonym - Gomon pers. comm.]		
OPISTOGNATHIDAE		
Opisthognathus latitabundus (Whitley)		BT+*
O. sp.		BT*
PINGUIPEDIDAE		
Parapercis nebulosa (Quoy and Gaimard)	(CSIRO)	BT*
PHOLIDICHTHYIDAE		
Pholidichthys sp.		BT+
URANOSCOPIDAE		
Ichthyoscopus fasciatus Haysom	(CSIRO)	BT
Uranoscopus cognatus Cantor		BT+
U. fuscomaculatus Kner	(Günther 1880)	BT
U. kaianus Günther	(Günther 1880)	BT
?U. oligolepis (Bleeker)	(Wei *et al.* 1972)	BT
U. sp. 2 (400016)	(CSIRO)	BT
U. sp. 1 (400009)		BT
CHAMPSODONTIDAE		
Champsodon arafurensis Regan?		BT+
BLENNIIDAE		
Xiphasia setifer Swainson		BT
CONGROGADIDAE		
Congrogadoides spinifer Borodin		BT+
CALLIONYMIDAE		
Callionymus belcheri Richardson		BT
[Previously misidentified as *C. longicuudatus* Schlegel by Günther (1880) fide Fricke (1983)]		
C. japonicus japonicus Houttyn		BT+
C. *limiceps* Ogilby	(CSIRO)	BT
C. keeleyi Fowler		BT+
C. *octostigmotus* Fricke		BT
C. *sublaevis* McCulloch	(CSIRO)	BT
Synchiropus delandi Fowler		BT
S. altivelis (Temminck and Schlegel)?		BT
GOBIIDAE		
Amoya sp. a		BT+
A. sp. b		BT+
A. sp. c		BT+
Bathygobius sp.		BT+
Lobulogobius morrigu Larson	(Larson 1983)	BT
Lubricogobius ornatus Formanoir		BT+
Priolepis sp.		BT+
[Previously recorded as *Gobius* sp. by Günther (1889)]		
P. sp. (*cf. nuchifasciatus*)		BT+
Sueviota larsonae Winterbottom and Hoese		BT+
AMBLYOPIDAE		
Amblyotrypauchen fraseri	(AMS)	BT
Brachyamblyopus sp.	(AMS)	BT
Ctenotrypauchen sp.		BT
ACANTHURIDAE		
Acanthurus grammoptilus Richardson		BT+*
SIGANIDAE		
Siganus fuscescens (Houttuyn)		BT+*
GEMPYLIDAE		
Neoepinnula orientalis (Gilchrist and von Bonde)	(CSIRO)	BT*
Rexea sp. (439002)	(CSIRO)	BT*
TRICHIURIDAE		
Tentoriceps cristatus (Klunzinger)	(CSIRO)	BT
Trichiurus lepturus **Linnaeus**		**BT+**
SCOMBRIDAE		
Auxis thazard **(Lacepède)**	**(Lyle and Timms 1984)**	**GN**

Cybiosordo elegans (Whitley)	(Lyle and Timms 1984)	GN
Euthynnus offinis (Cantor)	(Lyle and Timms 1984)	GN
?*Rostrelliger chrysozonus* (Rüppell)	(Wei *et al.* 1972)	BT
R. kanagurta (Cuvier)		BT+,GN
Scomberomorus commerson (Lacepède)	(FR)	BT+,GN
?*S. guttotus* (Bloch and Schneider)	(Lyle and Timms 1984)	GN
S. munroi Collette and Russo	(FR)	BT+,GN
[This species was recorded by Walter (1981) as *S. niphonius* (Cuvier), which according to Collette and Nauen (1983) is a misidentification of *S. munroi*.]		
S. queenslandicus Munro		BT+,GN
S. semifasciatus (Macleay)	(Lyle and Timms 1984)	GN
Thunnus tonggol (Bleeker)		GN
XIPHIIDAE		
Xiphias gladius Linnaeus		GN
ISTIOPHORIDAE		
Istiophorus platypterus (Shaw and Nodder)	(Read and Ward 1986)	GN,LL
Makaira indica (Cuvier)	(Nakamura 1974)	LL
CENTROLOPHIDAE		
Psenopsis anomala (Temminck and Schlegel)		BT+
NOMEIDAE		
?*Cubiceps squamiceps* (Lloyd)	(Wei *et al.* 1972)	BT
ARIOMMATIDAE		
Ariommo indica (Day)		BT+
PSETTODIDAE		
Psettodes erumei (Bloch and Schneider)		BT+
CITHARIDAE		
Brachypleura novaezealandiae Günther		BT+*
BOTHIDAE		
Arnoglossus topeinosoma (Bleeker)		BT+
A. waitei Norman		BT+
Asterhombus sp.		BT+
Engyprosopon grandisquama (Temminck and Schlegel)	(Norman 1934)	BT*
[This species was originally described from the Arafura Sea as *Rhomboidichthys spilurus* by Günther (1880), but is a junior synonym of *E. grondisquama* according to Norman (1934)]		
Grammatobothus polyophthalmus (Bleeker)		BT+
Laeops parviceps Günther		BT+
Pseudorhombus arsius (Hamilton)	(CSIRO)	BT*
P. diplospilus Norman		BT+
P. dupliciocellatus Regan	(FR)	BT+
P. elevatus Ogilby		BT+*
?*P. pentophthalmus* (Günther)	(Wei *et ol.* 1972)	BT
P. spinosus McCulloch	(FR)	BT+
P. sp. (460035)	(CSIRO)	BT
PLEURONECTIDAE		
Samariscus sp.		BT+
SOLEIDAE		
Dexillichthys muelleri (Steindachner)		BT+
Zebrias quagga (Kaup)		BT*
CYNOGLOSSIDAE		
Cynoglossus macrophthalmus Norman	(CSIRO)	BT*
C. kopsi Bleeker	(Günther 1880)	BT*
C. sp. (463002)	(CSIRO)	BT*
C. sp. (463010)	(CSIRO)	BT*
Symphurus sp.		BT+*
TRIACANTHIDAE		
Triacanthus biaculeatus (Bloch)	(CSIRO)	BT
Trixiphichthys weberi (Chaudhuri)		BT+
TRIACANTHODIDAE		
Halimochirurgus centriscoides Alcock		BT
Macrorhamphosodes platycheilus Fowler		BT
Tydemania navigotoris Weber		BT
BALISTIDAE		
Abalistes stellaris (Lacepède)		BT+
MONACANTHIDAE		
Alutera monoceros (Linnaeus)		BT+*
Monacanthus chinensis (Osbeck)	(CSIRO)	BT*
Chaetoderma penicilligera Cuvier	(Günther 1880)	BT
Paramonacanthus filicauda (Günther)		BT+
P. japonicus (Tilesius)	(CSIRO)	BT
Pseudomonacanthus peroni (Hollard)	(CSIRO)	BT
OSTRACIIDAE		
Ostracion cubicus Linnaeus	(FR)	BT+
Rhyncostracion nasus (Bloch)		BT+
R. rhinorhynchus (Bleeker)		BT+
Tetrosomus gibbosus (Linnaeus)	(CSIRO)	BT
TETRAODONTIDAE		
Amblyrhynchotes spinosissimus (Regan)	(CSIRO)	BT
Anchisomus multistriatus Richardson		BT+
Arothron nigropunctatus (Bloch and Schneider)	(Günther 1880)	BT
A. stellatus (Bloch and Schneider)		BT+
Chelonodon patoca (Hamilton-Buchanan)	(CSIRO)	BT
Lagocephalus inermis (Temminck and Schlegel)		BT+
L. lunaris (Bloch and Schneider)		BT+
L. sceleratus (Gmelin)		BT+
L. spadiceus (Richardson)		BT+
Torquigener pallimaculatus Hardy		BT+
TRIODONTIDAE		
Triodon macropterus Lesson	(CSIRO)	BT
DIODONTIDAE		
Cyclichthys hardenbergi (Beaufort)	(CSIRO)	BT
Cyclichthys orbicularis (Bloch)		BT+
?*Diodon holocanthus* Linnaeus	(Wei *et ol.* 1972)	BT
[This species was recorded as *D. maculifer* Kaup, a probable junior synonym of *D. holocanthus* (Leis 1978)]		
Tragulichthys jaculiferus (Cuvier)		BT+